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RESEARCH ARTICLE

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UHPLC/GC-TOF-MS metabolomics, MTT assay, and molecular docking studies reveal physostigmine as a new anticancer agent from the ethyl acetate and butanol fractions of *Kigelia africana* (Lam.) Benth. fruit extracts

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Abstract

Kigelia africana plant is widely used as a herbal remedy in preventing the onset and the treatment of cancer-related infections. With the increase in the research interest of the plant, the specific chemical compound or metabolite that confers its anticancer properties has not been adequately investigated. The ethyl acetate and butanol fractions of the fruit extracts were evaluated by 2-(4,5-dimethylthiazol-2-yl)-3,5-diphenyl-2H-tetrazolium bromide assay against four different cell lines, with the ethyl acetate fraction having inhibition concentration values of 0.53 and 0.42 μM against Hep G2 and HeLa cells, respectively. More than 235 phytoconstituents were profiled using UHPLC-TOF-MS, while more than 15 chemical compounds were identified using GC–MS from the fractions. Molecular docking studies revealed that physostigmine, fluazifop, dexamethasone, sulfisomidine, and desmethylmirtazapine could favorably bind at higher binding energies of −8.3, −8.6, −8.2, and −8.1 kcal/mol, respectively, better than camptothecin with a binding energy of −7.9 kcal/mol. The results of this study showed that physostigmine interacted well with topoisomerase IIα and had a high score of pharmacokinetic prediction using absorption, distribution, metabolism, excretion, and toxicity profiles, thereby suggesting that drug design using physostigmine as a base structure could serve as an alternative against the toxic side effects of doxorubicin and camptothecin.

KEYWORDS

camptothecin, doxorubicin, GC–MS, *Kigelia africana*, physostigmine, UHPLC-TOF-MS

1 | INTRODUCTION

Kigelia africana, a quintessential tradomedical plant of African origin, is widely used in herbal preparations for the treatment of numerous diseases such as diarrhea, rheumatism, psoriasis, and wounds (Bello, Shehu, Musa, Abdullah, & Mahmud, 2016; Kaur, Shyam, & Amutha, 2012; Neba, 2006). Recent research studies on the plant have shown that *K. africana* (Lam.) Benth. plant has antioxidant

Abbreviations: A375, human melanoma cancer line; HEK 293, human embryonic kidney cell line; HeLa, human cervical cancer cells; Hep G2, human hepatoma cancer line; MTT, 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide.

